

Trends In Amplification

From the Editor

In the early 1990s I would guess that many practicing audiologists like myself, felt like they had a pretty good handle on hearing aid verification using probe microphone equipment. Since that time however, a whole new group of questions has surfaced related to probe microphone testing. For example: 1) Can I, and should I, perform probe microphone verification of digital hearing aid fittings? 2) If I do this verification, what test signal should I use? 3) How do I verify some of the features of current “high tech” hearing aids? 4) I read something about a new probe microphone standard a few years ago. Does this have any impact on how I do, or talk about, probe microphone testing?

So has probe microphone testing really changed that much? If so, what’s new with probe microphones? In this issue of *Trends* important issues related to probe microphone testing in hearing aids will be discussed from a few different viewpoints. First, H. Gustav Mueller, PhD, will provide a review of some probe-microphone basics, and an update of some useful techniques and terminology used in the verification of current and future hearing aids. Many of you may already associate Dr. Mueller with probe microphone testing because of his contributions to the popular textbook *Probe Microphone Measurements: Hearing Aid Selection and Assessment*, which he edited and authored with David B. Hawkins, PhD, and Jerry L. Northern, PhD. Although this book was published all the way back in 1992, many instructors I know still use portions of it in their hearing aid courses attesting to the importance and comprehensive nature of this text. More recently, Dr. Mueller co-authored *The Audiologists’ Desk Reference* (Volumes 1 and 2) with James W. Hall III, PhD. These volumes provide a wealth of clinical information as well as updating some of the outdated probe microphone information contained in *Probe Microphone Measurements*. Others of you may be more familiar with Dr. Mueller because of his, many published articles, books and book chapters, hundreds of presentations that he has given both nationally and internationally, or through his position of contributing editor of the Hearing Journal’s “Page 10” column.

Following Dr. Mueller’s review four short articles are presented from industry experts. Articles include those written by (in alphabetical order by company): 1) Sheila Sinclair, MClSc, William Cole, BASc, and John Pumford, MClSc (representing Etymonic Design [Audioscan]); 2) Heather Robson, BS (representing Frye Electronics); 3) Jennifer Groth, MA (representing GN Resound); 4) William Lesiecki, MA, Bud Majest, BGS, HIS, and Bobbi Redinger, MS (representing Siemens). I asked these authors to comment regarding the choice of signal type used for probe microphone measurements of current and future hearing aids. I also asked for any opinions related to current or future challenges for probe microphone manufacturers related to hearing instrument evaluation. The answers that I got from these authors are of special interest both because of the similarities and differences across the various manufacturers.

There was general agreement that test signals that are more similar in temporal pattern to real speech (rather than traditional-steady state signals) are an important tool for assessing many current and future hearing aids. However, Jennifer Groth points out that manufacturers may choose to implement instrument specific real-ear verification targets based on any signal, including swept pure tones. This author goes on to make the excellent point that sometimes it is the information desired that drives our choice of test signal. For example we may choose a steady state broadband signal to assess the timing characteristics of a digital noise reduction circuit as described by Dr. Mueller in the feature article. Many of the articles argue for test signals that are broadband as well as mimicking the long-term spectral and temporal properties of speech. For example Heather Robson cites research from Frye Electronics that has revealed how swept pure tones can sometimes lead to erroneous results when examining hearing aid gain. In contrast, Sheila Sinclair and colleagues describe a signal that can also be used to assess gain for speech type signals that is made up of pure tones burst. These authors also advocate the measurement of hearing aid output rather than gain. Finally Bill Lesiecki and colleagues offer some thoughts for the future of probe microphone systems including continued and

improved implementation of real-ear threshold measures and individual transfer functions in a 360° space.

The articles in this issue of *Trends* reveal fairly significant changes and additions to probe-microphone test signals and methodology. In part these changes are driven by the increasing complexity of signal processing in hearing aids. This has proven to be an exciting

change, and we are finally able to determine how a hearing aid will operate under specific listening conditions using test signals that emulate those same conditions—Reasonably reliable verification and good face validity—Not a bad combination at all.

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